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Analysis of Enterprise Resource Planning System (ERP) in Small and Medium Enterprises (SME) of Malaysian Manufacturing Sectors: Current Status and Practices

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ABSTRACT

Small and Medium-sized Enterprise (SME) requires to tap the power of Information Technology (IT) and integrate information system in order to stay competitive and customer oriented. Thus, the Enterprise Resource Planning (ERP) is one solution to integrate information technology infrastructure to meet global competition. This research paper investigates the factors that prevent Malaysian SMEs from fully adopting the ERP system. Through various literatures, this paper will address the degree of factors that gave an impact and provide rating of impact to the SMEs. Quantitative surveys were done in 21 SMEs to understand the actual situation of ERP adoption. The research instrument use was the online survey system. Results from the survey concludes that the on-availability of suitable ERP system the meets the SME business needs is one of the five important factors that prevents the adoption of such system.

Keywords: ERP, SME, information system, business needs, manufacturing

ABSTRAK

Enterprise Kecil dan Sederhana (EKS) perlu menggunakan kuasa Teknologi Maklumat (TM) dan mengintegrasikannya dengan sistem maklumat supaya kekal berdaya saing dan berorientasikan pelanggan. Justeru itu, Perancangan Sumber Enterprise (PSE) telah menjadi satu penyelesaian bagi mengintegrasikan infrastruktur teknologi maklumat untuk mencapai persaingan global. Kertas penyelidikan ini menyiasat pelbagai faktor yang menjadi penghalang kepada penggunaan sistem PSE dan EKS di Malaysia. Melalui pelbagai kajian literatur, kertas ini juga menerangkan tahap faktor penghalang yang memberi kesan ke atas EKS ini. Kaji selidik kuantitatif secara dalam talian, dilaksanakan terhadap 21 buah EKS untuk memahami situasi sebenar penggunaan PSE. Hasil kaji selidik menyarankan satu faktor utama daripada lima faktor lain, ialah tiadanya sistem PSE yang sesuai untuk EKS. Ini telah menjadi penghalang utama kepada penggunaan PSE dan EKS tempatan.

Kata Kunci: ERP, EKS, sistem maklumat, keperluan perniagaan, pembuatan

INTRODUCTION

According to the United Nation Economic Commission for Europe (UNECE), the economic globalization has a dual impact on SME's. It provides new opportunities to some SMEs for Expansion and growth through increased international marketing possibilities by improving quality, competitiveness and management practices. In general, globalization brings risks due to which they are unlikely to survive in their present form. A wide barrier for SME's to enter international trading is due to the lack of quality information, techniques, standards and conformity available to them.

Furthermore, the need of business organization to exchange real time information has grown since the adoption of e-commerce technology (Themistocleous & Chen 2004). To address this need, an organization might have to integrate their information technology infrastructures. In today's global economy, integration is considered as a sore point within organizations. For small and medium sized enterprises integration is a significant problem due to high costs and technology requirements. Some cases show that SMEs can improve their competitiveness by integrating their systems with their suppliers, or trading partners. In addition, web services can be exploited to further simplify integration problems. In the long run, globalization endangers the existence of SMEs if they are unable to remove the barrier to enter into international trading.

The adoption of ERP systems among SMEs are still at a slower pace compared to large organizations. Nearly half of the large companies that have adopted ERP over the past five year period had experienced significant delays in ERP implementation schedule and cost overruns. Moreover, mid-sized companies are even far worst (Osman et al. 2006). Before starting any new ERP implementations in Small and Medium Enterprise (SMEs) sectors the reasons behind the failure of the earlier implementation must be known in order to overcome the previous mistakes in the implementation and to obtain maximum benefits of the ERP adoption. Therefore, this study investigated and rated the actual causes that stand behind the lack of ERP adoption

within manufacturing SMEs in Malaysia. Consequently, the findings of this study can be used as a guideline for SMEs to successfully adopt ERP system. It would also help the ERP vendors and SMEs researchers to determine the main factors that contribute to the weakness of ERP implementation in the area of Malaysian SMEs.

BACKGROUND

ENTERPRISE RESOURCES PLANNING SYSTEM (ERP)

According to Nah et al. (2001) ERP is defined as a packaged business software system that enables a company to manage an efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization's information-processing needs.

If well-implemented, this software facilitates the integration of all the functional information flows across the organization into a single package with a common database. Therefore, it allows easy and direct access to information about inventory, product or customer data, and prior history information (Shehab et al. 2004). A number of research studies have identified a variety of benefits that the ERP systems bring to organizations. O'Leary (2000) mentioned that an ERP system integrates the majority of the business processes and allows access to the data in real time. Furthermore, ERP improves the performance level of a supply chain by helping to reduce cycle times (Gardiner et al. 2002). There are also some intangible benefits that an organization may enjoy by implementing an ERP system such as better customer satisfaction, improved vendor performance, increased flexibility, reduced quality costs, improved resource utility, improved information accuracy and improved decision-making capability (Siriginidi 2000).

ADOPTION OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) WITHIN SMALL AND MEDIUM ENTERPRISES

Despite the enormous benefits of information technology, the SMEs in most of the developing countries in the Asia-Pacific region are still slow in adopting the ICT but their counterparts in developed countries are using advanced information technology. One reason that leads to the limited adoption is the lack of dynamism between ICT companies and SMEs outside the ICT sector. In the past the ICT companies did not provide goods and services tailored to the needs of small and medium enterprises because the demand from small and medium-sized companies was very low. The reason for the low demand is due to the complexity and higher cost of the ICT especially the ERP system The result are summarized in the limited supply and limited demand that eventually excludes SMEs from the benefits of ICT (Kotelnikov 2006).There are also other factors that contribute to the limited supply and demand of ICT product for SMEs, such as:

1. Supply Side
    a. Poor communications infrastructure results in limited access and higher costs.
    b. Most advanced ICT products are designed for larger firms and not SMEs.
2. Demand Side as given by Kotelnikov (2006)
    a. Limited ICT literacy of SME owners hinders their ability to choose the appropriate Technology and understand the concrete benefits it can bring to their business.
    b. Limited ICT literacy of employees in SMEs hinders ICT adoption.
    c. Adopting ICT is an adaptive challenge, not a technical challenge.
    d. Lack of financing options limits SME ability to purchase ICT.
    e. Lack of financial and legal infrastructure.

However, not all ERP implementation were successfully completed. The Boston Consulting Group survey of 100 executives from leading companies found that only one in three ERP initiatives were considered successful. This complexity with effectively implementing ERP systems suggests that many companies do not appreciate the issues and problems typically faced during the life cycle of the ERP (Chang et al. 2000). Additionally, a lot of companies implementing ERP have failed to achieve major benefits. The reasons are that the implementation of ERP system is complex, organizationally disruptive, resource intensive and higher values of implementation time and cost. In actuality, ERP implementation is costly. Although ERP software is expensive, extensive amount of business cost is in general spent on consulting to overcome difficult software (Osman et al. 2006).

ADOPTION OF ERP SYSTEM WITHIN MALAYSIAN SMALL AND MEDIUM-SIZED ENTERPRISES (SMES)

According to the Small and Medium Industries (SMI) Association of Malaysia most of the small and medium-sized enterprises are not provided with the appropriate information technology infrastructure that allows the ERP system implementation, and less than 20% of SMEs have internet facilities. In contrast, 85% of the 7.6 million SMEs in the United States of America can use Internet (Abdullah & Bakar 2000). A survey conducted on 12,000 SMEs in Malaysia indicated that only 16% of them have web presence in contrast to 80% of similar enterprises in Europe and North America (Abdullah & Bakar 2000). Implementation of information technology in small and medium-sized companies in Malaysia is still in a very basic level where the computers are used just for basic accounting and word processing. Usage of sophisticated applications such as Enterprise Resource Planning (ERP), Supply Chain Management (SCM) and Customer Relationship Management (CRM) are uncommon because of its usefulness has not been fully appreciated.

Finally, the efforts have not been fully translated into results of the SMEs in manufacturing as only 10% of SMEs used ERP, 10.1% used CRM software, 13% used computer-aided manufacturing, and 24.8% used computer-aided design. SMEs as a whole, only 30% owned a website and use ICT extensively in their daily operations (Kotelnikov 2006).

FAILURE FACTORS OF ERP IMPLEMENTATION WITHIN MALAYSIAN SMALL AND MEDIUM ENTERPRISES

High failure rate and difficulties in implementing ERP systems are extensively identified and discussed throughout previous literature studied. Low level of ERP system adoption within SMEs encompasses two sides: (1) The total failure, which refers to an initiative which was never implemented or in which a new system is implemented but was immediately abandoned, (2) Partial failure and is the sustainability failure of an information system that succeeds initially but then faced difficulties during implementation (Noudoostbeni et al. 2009).

Previous studies focused on the five factors that prevent manufacturing SMEs from adopting ERP system: (1) Fear of failure to make the employees and customers to accept ERP systems; (2) Higher values of implementation time & cost and Lack of financing options limits SME ability to purchase ICT; (3) The ready-made ERP systems developed by computer companies contains complex and advanced functions that not suitable and compatible with manufacturing SMEs functions, and some of these functions are not used within SMEs area, the cost of the development process will be high, in case where the SMEs need ERP system that is compatible with their business functions; (4) Developing advanced ICT products such as ERP system are not in the terms of their enterprise policy and they think the ERP system is not important to improve their business and manufacturing performance; and (5) Business functions of the enterprise are simple and not complex so that there is no need to adopt ERP system as computerizing and integrating these functions via simple ICT products are more than enough.

The proposed difficulties are partially derived from the previous literature studies. These studies suggested that the five difficulties faced by manufacturing SMEs during ERP implementation should be considered to understand the difficulties that negatively affect the success of the adoption of ERP in Malaysian SMEs. The five pre considered difficulties were: (1) Change in business goals during the project; (2) High cost on software consulting and maintenance; (3) ERP system acceptance and interaction issues among ERP system users; (4) The business functions involved within the readymade ERP systems shows a complex and advanced functions that not suitable and incompatible with the SMEs sized functions, and some of these developed functions have not been used by SMEs; and (5) Lack of interaction and understanding for supply chain and customers with the ERP system.

By understanding the interrelationship between the pre-considered difficulties and factors and their variables, a better understanding on what exactly holds the Malaysian SMEs from adopting an ERP system can be achieved. These pre-considered difficulties and factors somehow need to be re-customized again for the questionnaire that will be used for this research work.

RESEARCH METHODOLOGY

Figure 1 illustrates the selected research method. In order to achieve these objectives the research was conducted using quantitative survey method using two instruments. The online survey conducted through the Survey Monkey website was the first instrument and the second instrument was the questionaires. The survey questioners were distributed during a Small and Medium Industries Development Corporation (SMIDEC) seminar for the managing directors of Manufacturing SMEs. The survey was aimed at identifying the respondents' ideologies and attitudes towards the present ERP systems and the hurdles that block the successful and complete ERP implementation in Malaysian manufacturing SMEs. It is important for the researchers and developers to know these facts prior to the development of ERP modules. The respondents were the chief information officers (CIO), the directors of MIS, IT Managers or any person responsible for ERP System.

The survey was bifurcated as follows: The first part focused on the companies that have already implemented ERP systems while the second part delt with the companies that have never implemented these systems. Through the first section it was able to understand and difficulties faced by the organizations during their ERP implantation cycle while the second section revealed the facts and reasons that stops the companies from implementing the ERP systems. Moreover respondents of both the sections were asked to answer open ended questions to express their views on the limitations of ERP adoption.

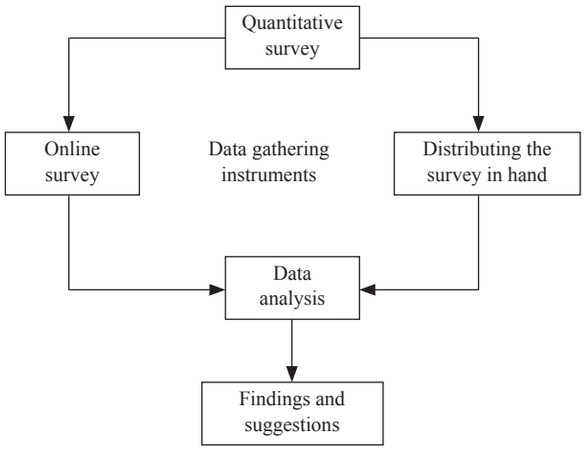

FIGURE 1. Research Methodology

SURVEY POPULATION

This survey represents a preliminary study on SMEs in Malaysia. An extensive research was conducted that can be obtained from many different resources available in the libraries, journals and internet SMIDEC was enquired to check whether Small and Medium Manufacturing Enterprises have applied ERP system or Vice Versa. This Survey covered 21 sectors of SMEs in Malaysia (Table 1). A total of 1,310 respondents from the 21 sectors participated in the survey.

TABLE 1. SME manufacturing sectors in Malaysia

Sectors		Sectors	
1.	Chemical Petrochemical	12.	RB (MRS)-Packaging
2.	Products Electronic and Electronics	13.	Distribute trade INC. wholesale & retail
3.	Food Beverage	14.	Wood &Wood Products
4.	Machinery & Engendering	15.	Transport Equipments
5.	Manufacturing Related Service	16.	Textiles & Apparel & Leather
6.	Non-Metallic Mineral Products	17.	Rubber Products
7.	Pal Oil Based Products	18.	MFG of Professional, Medical, Scientific
8.	Paper & Printing	19.	Construction
9.	Metal Product	20.	Office, accounting &computing machinery
10.	Healthcare	21.	Plastic products
11.	Pharmaceutical		

RESULTS AND DISCCUSSIONS

RESPONSE RATE

According to the Small and Medium Industries Development Corporation (SMIDEC) of Malaysia 21 sectors where under the category of manufacturing. Hence, in order to achieve a broader coverage of the survey two major instruments were adopted as mentioned earlier and the responses are as follows:

1. Online survey was carried out in 1,100 companies through Survey Monkey website, survey sent to. Out of the 1100 sets of survey instrument distributed, 253 respondents responded, Yusof & Aspinwall (2000) claimed the response rate of 20% to 25% can be considered as normal and be accepted for online survey. Thus, the response rate of this study can be considered reasonable for data analysis.
2. A group administered survey was done during a seminar for manager directors of different sectors of manufacturing SMEs. The number of respondents during the two seminars were 210 and out of which 179 respondents reacted positively to the survey.
3. A total of 432 respondents from the above mentioned instruments covered 21 sectors from the manufacturing category of Malaysian SMEs as tabulated in Table 2. Boned on the table, 27 respondents were from electronics and telecommunication sectors and 17 respondents were from the Paper & Printing sectors and they constituted as major and minor participants, respectively.

TABLE 2. Response rate from manufacturing SMEs sectors

Sectors	Number of Respondents
Chemical Petrochemical	19
Products Electronic and Electronics telecommunication	27
Food Beverage	20
Machinery & Engendering	19
Manufacturing Related Service	17
Non-Metallic Mineral Products	23
Pal Oil Based Products	21
Paper & Printing	17
Metal Product	19
Healthcare	20
Pharmaceutical	18
RB(MRS)-Packaging	21
Wholesale & retail	22
Wood & Wood Products	25
Transport Equipments	24
Textiles & Apparel & Leather	21
Rubber Products	18
MFG of Professional, Medical, Scientific	19
Construction	23
Office, accounting & computing machinery	21
Plastic products	18
Total respondents	432

MANUFACTURING SMES THAT HAVE IMPLEMENTED ERP SYSTEM

Table 3 below, shows the low percentage of implementation of ERP System in the manufacturing sector of SMEs. This indicates the slow adoption rate of ERP system in Malaysian manufacturing SMEs.

TABLE 3. Manufacturing of SMEs Implemented ERP system

Number of SMEs implemented ERP	Number of SMEs did not implement ERP
31 (9%)	326 (91%)

This justifies that, efforts in adopting ICT products have not been fully translated into results. Only about 10% of SMEs used ERP, 10.1% used CRM software, 13% used computer-aided manufacturing, and 24.8% computer-aided design (Kotelnikov 2006). Only 30% of manufacturing SMEs as a whole, owned websites and use ICT extensively in their daily operations. Accordingly, there is a need to identify the factors that lead to ineffective adoption of ERP System within manufacturing SMEs in Malaysia.

MANUFACTURING SMES FACED DIFFICULTIES WITH ERP IMPLEMENTATION

It is clearly evident from Table 4 that more than 50% of the manufacturing SMEs faced difficulties during ERP implementation. This percentage is due to the failure or incompleteness of ERP implementation. According to Wong et al. (2005), these failures may lead to other organizational problems as serious as bankruptcy. However, globally only one in three ERP attempts were considered successful. Therefore, this percentage can be considered normal (Dickel & Sirkin 2000).

TABLE 4. Difficulties faced by manufacturing SMEs with ERP implementation

Number of SMEs faced difficulties with ERP implementation	Number of SMEs did not face difficulties with ERP implementation
18 (58%)	13 (42%)

THE DIFFICULTIES FACED BY MANUFACTURING SMES DURING ERP IMPLEMENTATION

The respondents were asked to provide reasons on the difficulties of ERP. This is vital in order to rate the degree of importance of each difficulty for ERP implementation based on the percentage of each difficulty. The summarized results of the four focused difficulties are as follows:

Difficulty (A): High cost on software consulting and maintenance.

Difficulty (B): ERP system acceptance and interaction issues among ERP system users.

Difficulty(C): The business functions involved within the readymade ERP systems shows a complex and advanced functions that not suitable and compatible with the SMEs sized functions, and some of these developed functions have not been used within SMEs area.

Difficulty (D): Lack of interaction and understanding for supply chain and customers with the ERP system.

The order of difficulties by degree of importance is illustrated in Figure 2.

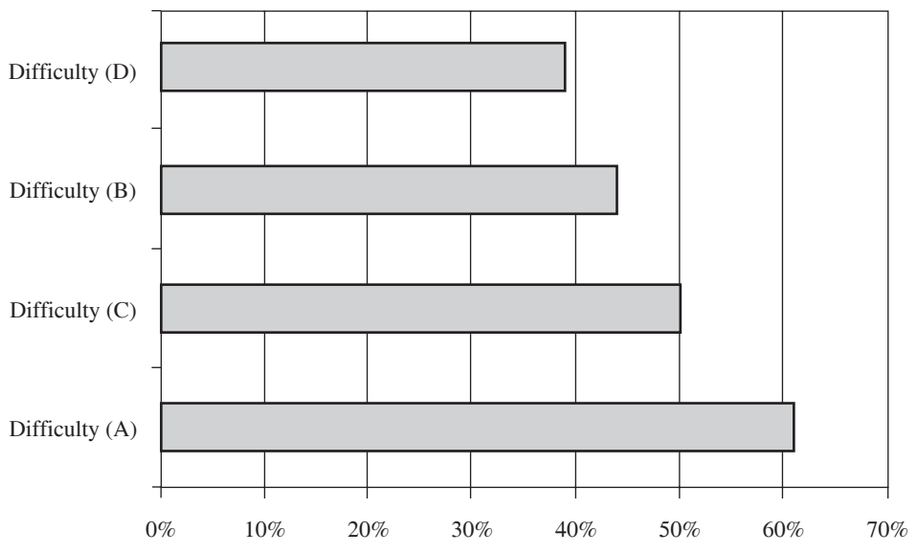

FIGURE 2. Order of difficulties by percentage

The empirical data from the above figure clearly indicates that the high cost, huge consultation fees to overcome software problems and maintenance cost are major difficulties faced by the Malaysian manufacturing SMEs while implementing ERP systems (Nah et al. 2001). The other reasons for the difficulty in their implementation are the complexity and non related advanced functions in the readymade ERP systems. Lack of acceptance and improper interaction of employees with ERP systems, not understanding the supply chain and lack of interaction with customers are the other difficulties identified by this study. Those afore mentioned problems which had been investigated in this study constituted the difficulties typically faced by the manufacturing of SMEs in Malaysia during the life cycle of ERP system.

THE FACTORS PREVENTING MANUFACTURING SMES FROM ADOPTING ERP SYSTEM

Analyzing all the results and findings from the survey revealed five major factors that stand behind the fair implementation and weak adoption of ERP systems in manufacturing SMEs. The degree of importance for each factor is rated based on the percentage of each reason in order to quantify the impact of each factor over the adoption of ERP. The five factors are as follows:

Factor (A): The Complexity and non-compatibility of the ready-made ERP systems were not suitable for manufacturing SMEs functions, and some of these functions were not used within SMEs area. Developing an ERP system compatible with the business functions of the enterprise to fulfill its needs and requirements results in the high development cost.

Factor (B): Higher values of implementation time and cost and lack of financing options that limits SMEs to purchase ICT.

Factor (C): Fear of failure to make the employees and customers to accept the ERP system.

Factor (D): Developing advanced ICT products such as ERP system is not in the term of their enterprise policy and they presume that the ERP system is not important to improve their business and manufacturing performance.

Factor (E): The business functions of the enterprise are simple and not complex so no need to adopt some of ERP modules instead computerizing and integrating some of these functions through simple ICT products is enough.

Figure 3 reveals that 42.94% of the respondents felt that factor (A) was the main reason for the lack of adoption of ERP systems. Factor (A) constituted that the complexity and non-compatibility of the ready-made ERP systems are not suitable for manufacturing SMEs functions, and some of these functions were not used within SMEs area and in case of developing an ERP system compatible with the business functions of the enterprise to fulfill its needs and requirements results in the high development cost. Whereas, the second factor that forced the non adoption of ERP systems was the fear of failure to make the employees and customers accept the ERP system. The third factor on ERP implementation was the higher values of implementation time and cost and lack of financing options that limits SMEs to purchase ICT. In addition the misunderstanding and poor awareness among the enterprises on the benefits of the ERP system and its role to improve the overall performance was the other factor that resulted in them to resist the adoption of ERP. Many SMEs believed that simple IT tools were enough for their business process as opposed to the costly ERP systems.

According to Wattegama and Chanawongse (2007), in the past ICT corporations failed to supply products that meet the needs of small and medium enterprises. The ICT

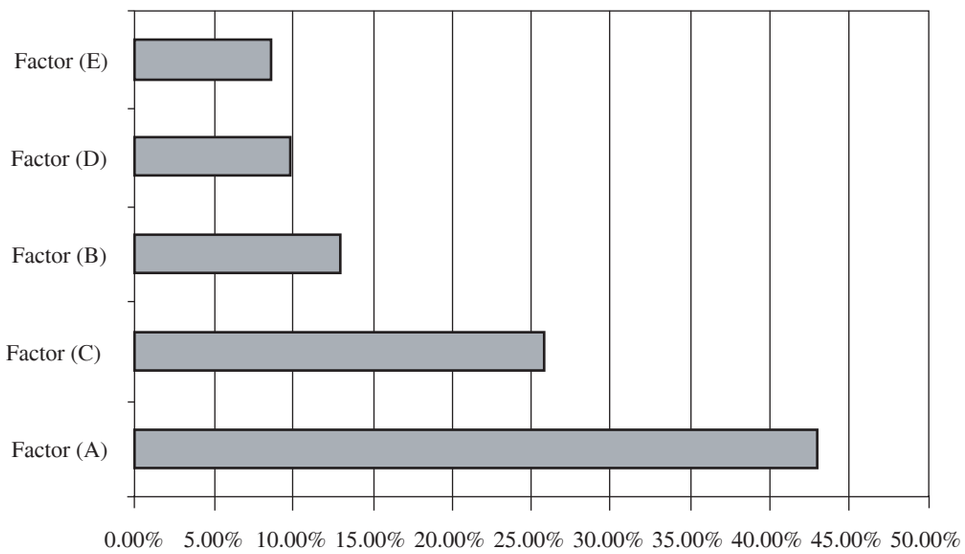

FIGURE 3. Order of the factors by degree of percentage

corporations did not concentrate to tailor the products to the SMEs need because there was no demand from them. The SMEs in-turn did not opt for the ERP systems due to their high costs and complexity.

Recently, Shahawai and Idrus (2010) identified that the complexity of the ERP's functions constituted the resistance of ERP systems' adoption. They also claimed that the SMEs feltl that the ERP adoption might burden their economical status.

Table 5 shows that each factor has different proportion of effects on the lack of ERP system adoption in all the subsectors of Malaysian manufacturing SMEs. The effects were based on exclusive characteristics of each sector. The differences in the level of impact factors suggested that studies were conducted separately on every sector to identify exclusive factors that stops ERP adoption in the respective sectors which differed from each other in terms of business process, product type, policy and strategy and exclusive ERP systems must be developed based on the sectors needs.

TABLE 5. Percentage of the factors by subsectors of manufacturing SMEs in Malaysia

Sub-sector	A	B	C	D	E
Chemical Petrochemical	31.25%	12.50%	37.50%	6.25%	12.50%
Products Electronic and Electronics	25.00%	25.00%	41.67%	8.33%	0.00%
Food Beverage	15.38%	30.77%	23.08%	23.08%	7.69%
Machinery & Engendering	18.18%	36.36%	18.18%	0.00%	27.27%
Manufacturing Related Service	35.29%	11.76%	41.18%	0.00%	11.76%
Non-Metallic Mineral Products	41.18%	17.65%	35.29%	5.88%	0.00%
Pal Oil Based Products	29.41%	11.76%	35.29%	23.53%	0.00%
Paper & Printing	23.08%	30.77%	23.08%	15.38%	7.69%
Metal Product	43.75%	12.50%	31.25%	6.25%	6.25%
Healthcare	52.94%	5.88%	23.53%	0.00%	17.65%
Pharmaceutical	58.82%	11.76%	17.65%	0.00%	11.76%
Wood &Wood Products	33.33%	13.33%	40.00%	6.67%	6.67%
Transport Equipments	58.82%	0.00%	17.65%	23.53%	0.00%
Textiles & Apparel & Leather	35.71%	14.29%	42.86%	7.14%	0.00%
Rubber Products	53.33%	0.00%	20.00%	13.33%	13.33%
MFG of Professional, Medical, Scientific	58.82%	0.00%	11.76%	23.53%	5.88%
Construction	52.94%	0.00%	5.88%	23.53%	17.65%
Office, accounting & computing machinery	64.29%	7.14%	21.43%	7.14%	0.00%
Plastic products	28.57%	21.43%	35.71%	14.29%	0.00%
RB(MRS)-Packaging	58.82%	5.88%	23.53%	0.00%	11.76%
Distribute trade INC. wholesale & retail	52.94%	5.88%	17.65%	0.00%	23.53%

CONCLUSION

This study has identified and evaluated the factors that constitute towards the lack of adoption of ERP system within SMEs in Malaysian Manufacturing sectors. The results of this study revealed 5 factors that had a major impact on the low adoption of ERP systems. These factors varied according to their effective impacts among the manufacturing SMEs subsectors. However, this study classified those factors based on their effectiveness. It can be concluded that the complexity and non-compatibility of the ready-made ERP systems were not suitable for manufacturing SMEs functions. Some of these functions were not used within SMEs area. Developing an ERP system compatible with the business functions of the enterprise to fulfill its needs and requirements results in the high development cost and this factor played an important role in the lack of ERP system adoption.

The findings of this research suggests that in order to derive the specification for successful ERP adoption, exclusive survey must be conducted in very manufacturing sector separately to develop an ERP system that meets the needs of those sectors. The study has identified that it is not necessary for the manufacturing SMEs to adopt the ERP systems designed for large scale companies. Instead they can adopt the customized ERP systems that cater the specific business needs to each sector. Thus, findings of this research provide indication on what should be considered as a strategy for the success of the exact specification in adopting an ERP system in manufacturing SMEs in Malaysia. The proposed factors can be used as a whole concept in assessing the factors affecting the

adoption of an ERP system. It also contributes to the understanding of the characteristics of SMEs in Malaysia that positively or negatively affects the adoption of an ERP system. This findings can also be used as a globalized indication to SMEs in other countries especially in Asia where the comparison of some characteristics are similar with manufacturing SMEs in Malaysia.

REFERENCES

Abdullah, M.A.H. & Bakar, M.I.H. 2000. *Small and Medium Enterprises in Asian Pacific Countries: Roles and Issues*. Ed. Nova Science Pub. Inc.

Chang, S.I., Gable, G., Smythe, E. & Timbrell, G. 2000. *A Delphi Examination of Public Sector ERP Implementation Issues*.

Dickel, K. & Sirkin, H. 2000. Getting value from enterprise initiatives: A survey of executives. *Boston Consulting Group, Inc. Retrieved from the World Wide Web*: http:// www. bcg. com/publications/files/Enterprise_computing_ report. pdf 18.

Gardiner, S.C., Hanna, J.B. & LaTour, M.S. 2002. ERP and the reengineering of industrial marketing processes: A prescriptive overview for the new-age marketing manager. *Industrial Marketing Management* 31(4): 357-365.

Hepworth, M. & Ryan, J. 2000. Small firms in Europe's developing information society. *The Information Society in Europe. Work and Life in an Age of Globalization*.

Nah, F.F.H., Lau, J.L.S. & Kuang, J. 2001. Critical factors for successful implementation of enterprise systems. *Business Process Management Journal* 7(3): 285-296.

Noudoostbeni, A., Yasin, N.M. & Jenatabadi, H.S. 2009. To investigate the success and failure factors of ERP implementation within Malaysian small and medium enterprises. hlm. 157-160.

O'Leary, D.E. 2000. *Enterprise Resource Planning Systems: Systems, Life Cycle, Electronic Commerce, and Risk*. Cambridge: Cambridge Univ Pr.

Osman, M., Yusuff, R., Tang, S. & Jafari, S.M. 2006. ERP systems implementation in Malaysia: the importance of critical success factors. *International Journal of Engineering and Technology* 3(1): 125-131.

Shahawai, S.S. & Idrus, R. 2010. *Pre-considered Factors Affecting ERP System Adoption in Malaysian SMEs*.

Shehab, E., Sharp, M., Supramaniam, L. & Spedding, T.A. 2004. Enterprise resource planning: An integrative review. *Business Process Management Journal* 10(4): 359-386.

Siriginidi, S.R. 2000. Enterprise resource planning in reengineering business. *Business Process Management Journal* 6(5): 376-391.

Themistocleous, M. & Chen, H. 2004. Investigating the integration of SMEs' information systems: an exploratory case study. *International Journal of Information Technology and Management* 3(2): 208-234.

Wattegama, C. & Chanawongse, K. 2007. *ICT for Disaster Management*. Ed. United Nations Development Programme. Asia-Pacific development information programme (UNDP-APDIP).

Wong, A., Scarbrough, H., Chau, P. & Davison, R. 2005. Critical Failure Factors in ERP Implementation.

Yusof, S.R.M. & Aspinwall, E.M. 2000. Critical success factors in small and medium enterprises: survey results. *Total Quality Management & Business Excellence* 11(4): 448-462.

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